AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Original) An information communication system, comprising:

a variable gain amplifier (VGA),

wherein the VGA is responsive to an input signal of the information communication system;

an analog-to-digital converter (ADC),

wherein the ADC is responsive to an output of the VGA;

a first filter,

wherein tap weight coefficients of the first filter are updated according to a first least mean square (LMS) engine,

wherein the first filter is responsive to an output of the ADC, and

wherein at least two tap weight coefficients of the first filter are constrained;

a second filter,

wherein tap weight coefficients of the second filter are updated according to an adaptation engine,

wherein the second filter is responsive to an output of the first filter,

wherein a number of tap weight coefficients of the second filter comprises one of less than and equal to a number of the tap weight coefficients of the first filter,

wherein the second filter comprises a three-tap filter,

wherein tap weight coefficients of the three-tap filter comprise "a", "1+b", and "–a", respectively,

wherein a value of tap weight coefficient "a" of the second filter is updated to provide a timing phase of the second filter that is associated with a change in timing phase error introduced by the first filter,

wherein the tap weight coefficient "a" is updated according to equation:
$a[n+1] = a[n] - \alpha * \Delta\theta$,

wherein a[n+1] comprises a value of the tap weight coefficient "a" for a next sampling time of the input signal,

wherein a[n] comprises a value of the tap weight coefficient "a" for a current sampling time of the input signal,

wherein α comprises a first gain constant, and

wherein $\Delta\theta$ comprises a change in timing phase error associated with the first filter,

wherein a value of tap weight coefficient "b" of the second filter is updated to provide a gain of the second filter that is associated with a change in gain error from the first filter,

wherein the tap weight coefficient "b" is updated according to equation: $b[n+1] = b[n] - \beta * \Delta\Gamma$,

wherein b[n+1] comprises a value of the tap weight coefficient "b" for a next sampling time of the input signal,

wherein b[n] comprises a value of the tap weight coefficient "b" for a current sampling time of the input signal,

wherein β comprises a second gain constant, and

wherein $\Delta\Gamma$ comprises a change in gain error from the first filter;

a gain controller for controlling gain of the VGA,

wherein the gain controller is in communication with the VGA and responsive to the output of the second filter,

wherein the gain of the second filter is configured to cause the gain controller to modify a gain of the VGA to compensate for the change in gain error from the first filter; and

a timing phase controller for controlling timing phase of the ADC,

wherein the timing phase controller is in communication with the ADC and responsive to an output of the second filter,

wherein the timing phase of the second filter is configured to cause the timing phase controller to modify a timing phase of the ADC to compensate for the change in timing phase error introduced by the first filter.

2. (Original) The information communication system of claim 1, wherein the adaptation engine comprises one of a second LMS engine and a zero-forcing engine.

3. (Previously Presented) The information communication system of claim 1, wherein the first filter comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter are constrained, and wherein $\Delta\theta$ is updated according to equation:

$$\Delta\theta = \frac{\left(-\Delta C_3 * K_e - \Delta C_4 * K_o\right)}{K_e^2 + K_o^2},$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a third gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

4. (Original) The information communication system of claim 3, wherein K_e and K_o are updated according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively,

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

5. (Original) The information communication system of claim 3, wherein K_e and K_o each comprise a predetermined value.

6. (Original) The information communication system of claim 3, wherein the error signal E[n] comprises a difference between an output of the first filter and an output of a reconstruction filter,

wherein the reconstruction filter is responsive to an output of a sequence detector, and

wherein the sequence detector is responsive to an output of the first filter.

7. (Previously Presented) The information communication system of claim 1, wherein the first filter comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter are constrained, and wherein Δθ is updated according to equation:

$\Delta\theta = (-\Delta C_3 * K_e - \Delta C_4 * K_o)$,

wherein ΔC_3 and ΔC_4 are updated according to equations:

ΔC_3 = μ*E[n]*X[n-3] and

ΔC_4 = μ*E[n]*X[n-4], respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a third gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

8. (Original) The information communication system of claim 7, wherein K_e and K_o are updated according to equations:

$$K_e = \sum_{n=0}^{M} \gamma C_{2n}$$, and

$$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$$, respectively, and

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

9. (Original) The information communication system of claim 7, wherein K_e and K_o each comprise a predetermined value.

10. (Original) The information communication system of claim 7, wherein the error signal E[n] comprises a difference between an output of the first filter and an output of a reconstruction filter,

wherein the reconstruction filter is in communication with an output of a sequence detector, and

wherein the sequence detector is responsive to an output of the first filter.

11. (Previously Presented) The information communication system of claim 1, wherein the first filter comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter are constrained, and wherein ΔΓ is updated according to equation:

$$\Delta\Gamma = \frac{\left(-\Delta C_3 * K_o + \Delta C_4 * K_e\right)}{\sqrt{K_e^2 + K_o^2}},$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

ΔC_3 = μ*E[n]*X[n-3] and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a third gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

12. (Original) The information communication system of claim 11, wherein K_e and K_o are updated according to equations:

$$K_e = \sum_{n=0}^{M} \gamma C_{2n} \text{, and}$$

$$K_o = \sum_{n=0}^{P} \gamma C_{2n+1} \text{, respectively,}$$

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

13. (Original) The information communication system of claim 11, wherein K_e and K_o each comprise a predetermined value.

14. (Original) The information communication system of claim 11, wherein the error signal E[n] comprises a difference between an output of the first filter and an output of a reconstruction filter,

wherein the reconstruction filter is responsive to an output of a sequence detector, and

wherein the sequence detector is responsive to an output of the first filter.

15. (Previously Presented) The information communication system of claim 1, wherein the first filter comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter are constrained, and wherein $\Delta\Gamma$ is updated according to equation:

$$\Delta\Gamma = (-\Delta C_3 * K_o + \Delta C_4 * K_e),$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a third gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

16. (Original) The information communication system of claim 15, wherein K_e and K_o are updated according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively, and

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

$M = TRUNCATE((N-1)/2)$, and

wherein P is determined according to equation:

$P = TRUNCATE(((N-1)/2) - 0.5)$.

17. (Original) The information communication system of claim 15, wherein K_e and K_o each comprise a predetermined value.

18. (Original) The information communication system of claim 15, wherein the error signal E[n] comprises a difference between an output of the first filter and an output of a reconstruction filter,

wherein the reconstruction filter is responsive to an output of a sequence detector, and

wherein the sequence detector is responsive to an output of the first filter.

19. (Original) The information communication system of claim 1, comprising:

a sequence detector, wherein the sequence detector is responsive to an output of the first filter.

20. (Original) The information communication system of claim 19, comprising:

a reconstruction filter, wherein the reconstruction filter is responsive to an output of the sequence detector.

21. (Original) The information communication system of claim 20, comprising:

an error generator in communication between an output of the second filter and inputs of the timing phase controller and the gain controller,

wherein the error generator generates an error signal comprising a difference between an output of the first filter and an output of the reconstruction filter.

22. (Original) The information communication system of claim 20, wherein the timing phase controller comprises an error generator,

wherein the timing phase controller is responsive to an output of the first filter and an output of the reconstruction filter.

23. (Original) The information communication system of claim 20, wherein the gain controller comprises an error generator,

wherein the gain controller is responsive to an output of the first filter and an output of the reconstruction filter.

24. (Previously Presented) An information communication system, comprising:

a variable gain amplifier (VGA) means for amplifying an input signal of the information communication system;

analog-to-digital converter (ADC) means for converting an output of the VGA means;

first filter means for filtering an output of said ADC means,

wherein tap weight coefficients of the first filter means are updated according to a first least mean square (LMS) engine means,

wherein the first filter means is responsive to an output of the ADC means, and

wherein at least two tap weight coefficients of the first filter means are constrained;

second filter means for filtering an output of said first filter means,

wherein tap weight coefficients of the second filter means are updated according to adaptation engine means for updating a tap weight coefficient,

wherein the second filter means is responsive to an output of the first filter means,

wherein a number of tap weight coefficients of the second filter means comprises one of less than and equal to a number of the tap weight coefficients of the first filter means,

wherein the second filter means comprises a three-tap filter means,

wherein tap weight coefficients of the three-tap filter means comprise "a", "1+b", and "–a", respectively,

wherein a value of tap weight coefficient "a" of the second filter means is updated to provide a timing phase of the second filter means that is associated with a change in timing phase error introduced by the first filter means,

wherein the tap weight coefficient "a" is updated according to equation: $a[n+1] = a[n] - \alpha * \Delta\theta$,

wherein a[n+1] comprises a value of the tap weight coefficient "a" for a next sampling time of the input signal,

wherein a[n] comprises a value of the tap weight coefficient "a" for a current sampling time of the input signal,

wherein α comprises a first gain constant, and

wherein $\Delta\theta$ comprises a change in timing phase error associated with the first filter means,

wherein a value of tap weight coefficient "b" of the second filter means is updated to provide a gain of the second filter means that is associated with a change in gain error from the first filter means,

wherein the tap weight coefficient "b" is updated according to equation: $b[n+1] = b[n] - \beta * \Delta\Gamma$,

wherein b[n+1] comprises a value of the tap weight coefficient "b" for a next sampling time of the input signal,

wherein b[n] comprises a value of the tap weight coefficient "b" for a current sampling time of the input signal,

wherein β comprises a second gain constant, and

wherein $\Delta\Gamma$ comprises a change in gain error from the first filter means;

gain controller means for controlling gain of the VGA means,

wherein the gain controller means is in communication with the VGA means and responsive to the output of the second filter means,

wherein the gain of the second filter means is configured to cause the gain controller means to modify a gain of the VGA means to compensate for the change in gain error from the first filter means; and

timing phase controller means for controlling timing phase of the ADC means,

wherein the timing phase controller means is in communication with the ADC means and responsive to an output of the second filter means,

wherein the timing phase of the second filter means is configured to cause the timing phase controller means to modify a timing phase of the ADC means to compensate for the change in timing phase error introduced by the first filter means.

25. (Previously Presented) The information communication system of claim 24, wherein the adaptation engine means comprises one of second LMS engine means and zero-forcing engine means for updating a tap weight coefficient.

26. (Previously Presented) The information communication system of claim 24, wherein the first filter means comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter means are constrained, and wherein $\Delta\theta$ is updated according to equation:

$$\Delta\theta = \frac{(-\Delta C_3 * K_e - \Delta C_4 * K_o)}{K_e^2 + K_o^2},$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a third gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

27. (Original) The information communication system of claim 26, wherein K_e and K_o are updated according to equations:

$$K_e = \sum_{n=0}^{M} \gamma C_{2n} \text{, and}$$

$$K_o = \sum_{n=0}^{P} \gamma C_{2n+1} \text{, respectively,}$$

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

28. (Original) The information communication system of claim 26, wherein K_e and K_o each comprise a predetermined value.

29. (Previously Presented) The information communication system of claim 26, wherein the error signal E[n] comprises a difference between an output of the first filter means and an output of reconstruction filter means for reconstructing an information signal based on an output of a sequence detector means,

wherein the sequence detector means is responsive to an output of the first filter means.

30. (Previously Presented) The information communication system of claim 24, wherein the first filter means comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter means are constrained, and wherein Δθ is updated according to equation:

$\Delta\theta = (-\Delta C_3 * K_e - \Delta C_4 * K_o)$,

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a third gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

31. (Original) The information communication system of claim 30, wherein K_e and K_o are updated according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively, and

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

32. (Original) The information communication system of claim 30, wherein K_e and K_o each comprise a predetermined value.

33. (Previously Presented) The information communication system of claim 30, wherein the error signal E[n] comprises a difference between an output of the first filter means and an output of reconstruction filter means for reconstructing an information signal based on an output of a sequence detector means,

wherein the sequence detector means is responsive to an output of the first filter means.

34. (Previously Presented) The information communication system of claim 24, wherein the first filter means comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter means are constrained, and wherein $\Delta\Gamma$ is updated according to equation:

$$\Delta\Gamma = \frac{\left(-\Delta C_3 * K_o + \Delta C_4 * K_e\right)}{\sqrt{K_e^2 + K_o^2}},$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a third gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

35. (Original) The information communication system of claim 34, wherein K_e and K_o are updated according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively,

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

36. (Original) The information communication system of claim 34, wherein K_e and K_o each comprise a predetermined value.

37. (Previously Presented) The information communication system of claim 34, wherein the error signal E[n] comprises a difference between an output of the first filter means and an output of reconstruction filter means for reconstructing an information signal based on an output of a sequence detector means,

wherein the sequence detector means is responsive to an output of the first filter means.

38. (Previously Presented) The information communication system of claim 24, wherein the first filter means comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter means are constrained, and wherein ΔΓ is updated according to equation:

$\Delta\Gamma = \left(-\Delta C_3 * K_o + \Delta C_4 * K_e\right)$,

wherein ΔC_3 and ΔC_4 are updated according to equations:

ΔC_3 = μ*E[n]*X[n-3] and

ΔC_4 = μ*E[n]*X[n-4], respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a third gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

39. (Original) The information communication system of claim 38, wherein K_e and K_o are updated according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively, and

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

40. (Original) The information communication system of claim 38, wherein K_e and K_o each comprise a predetermined value.

41. (Previously Presented) The information communication system of claim 38, wherein the error signal E[n] comprises a difference between an output of the first filter means and an output of reconstruction filter means for reconstructing an information signal based on an output of a sequence detector means, and

wherein the sequence detector means is responsive to an output of the first filter means.

42. (Previously Presented) The information communication system of claim 24, further comprising sequence detector means for detecting an information sequence based on an output of the first filter means.

43. (Previously Presented) The information communication system of claim 42, further comprising reconstruction filter means for reconstructing an information signal based on an output of the sequence detector means.

44. (Previously Presented) The information communication system of claim 43, further comprising error generator means for generating an error signal,

wherein said error generator means is in communication between an output of the second filter means and inputs of the timing phase controller means and the gain controller means, and

wherein said error signal comprises a difference between an output of the first filter means and an output of the reconstruction filter means.

45. (Previously Presented) The information communication system of claim 43, wherein the timing phase controller means comprises error generator means for generating an error signal based on an output of the first filter means and an output of the reconstruction filter means.

46. (Previously Presented) The information communication system of claim 43, wherein the gain controller means comprises error generator means for generating an error signal,

wherein the gain controller means is responsive to an output of the first filter means and an output of the reconstruction filter means.

47. (Original) An information communication system, comprising:

a variable gain amplifier (VGA), wherein the VGA is responsive to an input signal of the information communication system;

an analog-to-digital converter (ADC), wherein the ADC is responsive to an output of the VGA;

a first filter,

wherein tap weight coefficients of the first filter are updated according to a first least mean square (LMS) engine,

wherein the first filter is responsive to an output of the ADC, and

wherein at least one tap weight coefficient of the first filter is constrained;

a second filter,

wherein the second filter is responsive to an output of the first filter, and

wherein a number of tap weight coefficients of the second filter comprises one of less than and equal to a number of the tap weight coefficients of the first filter; and, at least one of:

a gain controller for controlling gain of the VGA, wherein the gain controller is in communication with the VGA and responsive to the output of the second filter; and

a timing phase controller for controlling timing phase of the ADC, wherein the timing phase controller is in communication with the ADC and responsive to an output of the second filter.

48. (Original) The information communication system of claim 47, wherein tap weight coefficients of the second filter are updated according to an adaptation engine.

49. (Original) The information communication system of claim 48, wherein the adaptation engine comprises one of a second LMS engine and a zero-forcing engine.

50. (Original) The information communication system of claim 47, wherein at least two tap weight coefficients of the first filter are constrained,

wherein a value of at least one tap weight coefficient of the second filter is updated to provide a gain of the second filter that is associated with a change in gain error from the first filter, and

wherein the gain of the second filter is configured to cause the gain controller to modify a gain of the VGA to compensate for the change in gain error from the first filter.

51. (Original) The information communication system of claim 47, wherein at least two tap weight coefficients of the first filter are constrained,

wherein a value of at least one tap weight coefficient of the second filter is updated to provide a timing phase of the second filter that is associated with a change in timing phase error introduced by the first filter, and

wherein the timing phase of the second filter is configured to cause the timing phase controller to modify a timing phase of the ADC to compensate for the change in timing phase error introduced by the first filter.

52. (Original) The information communication system of claim 47, wherein the second filter comprises one of a two-tap filter and a three-tap filter.

53. (Original) The information communication system of claim 52, wherein tap weight coefficients of the two-tap filter comprise "a" and "1+b", respectively, and

wherein tap weight coefficients of the three-tap filter comprise "a", "1+b", and "–a", respectively.

54. (Original) The information communication system of claim 53, wherein the tap weight coefficient "a" is updated according to equation:

$a[n+1] = a[n] - \alpha * \Delta\theta$,

wherein $a[n+1]$ comprises a value of the tap weight coefficient "a" for a next sampling time of the input signal,

wherein $a[n]$ comprises a value of the tap weight coefficient "a" for a current sampling time of the input signal,

wherein α comprises a first gain constant, and

wherein $\Delta\theta$ comprises a change in timing phase error associated with the first filter.

55. (Previously Presented) The information communication system of claim 54, wherein the first filter comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter are constrained, and wherein Δθ is updated according to equation:

$$\Delta\theta = \frac{(-\Delta C_3 * K_e - \Delta C_4 * K_o)}{K_e^2 + K_o^2},$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

56. (Original) The information communication system of claim 55, wherein K_e and K_o are updated according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively,

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

57. (Original) The information communication system of claim 55, wherein K_e and K_o each comprise a predetermined value.

58. (Previously Presented) The information communication system of claim 55, further comprising:

a sequence detector,

wherein the sequence detector is responsive to an output of the first filter;

a reconstruction filter,

wherein the reconstruction filter is responsive to an output of the sequence detector; and

an error generator,

wherein the error generator is responsive to the output of the first filter and an output of the reconstruction filter, and

wherein the error generator generates the error signal E[n] comprising a difference between the output of the first filter and the output of the reconstruction filter.

59. (Previously Presented) The information communication system of claim 54, wherein the first filter comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter are constrained, and wherein $\Delta\theta$ is updated according to equation:

$$\Delta\theta = \left(-\Delta C_3 * K_e - \Delta C_4 * K_o\right),$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu*E[n]*X[n-3]$ and

$\Delta C_4 = \mu*E[n]*X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

60. (Original) The information communication system of claim 59, wherein K_e and K_o are updated according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively, and

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

61. (Original) The information communication system of claim 59, wherein K_e and K_o each comprise a predetermined value.

62. (Previously Presented) The information communication system of claim 59, further comprising:

a sequence detector,

wherein the sequence detector is responsive to an output of the first filter;

a reconstruction filter,

wherein the reconstruction filter is responsive to an output of the sequence detector; and

an error generator,

wherein the error generator is responsive to the output of the first filter and an output of the reconstruction filter, and

wherein the error generator generates the error signal E[n] comprising a difference between the output of the first filter and the output of the reconstruction filter.

63. (Original) The information communication system of claim 53, wherein the tap weight coefficient "b" is updated according to equation:

$b[n+1] = b[n] - \beta * \Delta\Gamma$,

wherein b[n+1] comprises a value of the tap weight coefficient "b" for a next sampling time of the input signal,

wherein b[n] comprises a value of the tap weight coefficient "b" for a current sampling time of the input signal,

wherein β comprises a first gain constant, and

wherein $\Delta\Gamma$ comprises a change in gain error from the first filter.

64. (Previously Presented) The information communication system of claim 63, wherein the first filter comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter are constrained, and wherein $\Delta\Gamma$ is updated according to equation:

$$\Delta\Gamma = \frac{\left(-\Delta C_3 * K_o + \Delta C_4 * K_e\right)}{\sqrt{K_e^2 + K_o^2}},$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

65. (Original) The information communication system of claim 64, wherein K_e and K_o are updated according to equations:

$$K_e = \sum_{n=0}^{M} \gamma C_{2n}$$, and

$$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$$, respectively,

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

66. (Original) The information communication system of claim 64, wherein K_e and K_o each comprise a predetermined value.

67. (Previously Presented) The information communication system of claim 64, further comprising:

a sequence detector, wherein the sequence detector is responsive to an output of the first filter;

a reconstruction filter, wherein the reconstruction filter is responsive to an output of the sequence detector; and

an error generator, wherein the error generator is responsive to the output of the first filter and an output of the reconstruction filter,

wherein the error generator generates the error signal E[n] comprising a difference between the output of the first filter and the output of the reconstruction filter.

68. (Previously Presented) The information communication system of claim 63, wherein the first filter comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first filter are constrained, and wherein $\Delta\Gamma$ is updated according to equation:

$\Delta\Gamma = (-\Delta C_3 * K_o + \Delta C_4 * K_e)$,

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

69. (Original) The information communication system of claim 68, wherein K_e and K_o are updated according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively, and

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

70. (Original) The information communication system of claim 68, wherein K_e and K_o each comprise a predetermined value.

71. (Previously Presented) The information communication system of claim 68, further comprising:

a sequence detector, wherein the sequence detector is responsive to an output of the first filter;

a reconstruction filter, wherein the reconstruction filter is responsive to an output of the sequence detector; and

an error generator, wherein the error generator is responsive to the output of the first filter and an output of the reconstruction filter,

wherein the error generator generates the error signal E[n] comprising a difference between the output of the first filter and the output of the reconstruction filter.

72. (Currently Amended) The information communication system of claim 47, further comprising:

a sequence detector, wherein the sequence detector is responsive to an output of the first filter;

a reconstruction filter, wherein the reconstruction filter is responsive to an output of the sequence detector; and

an error generator, wherein the error generator is responsive to an output of the reconstruction filter, and

wherein the error generator is in communication ~~between an output of~~with the second filter, ~~and inputs of~~ the timing phase controller, and the gain controller.

73. (Original) The information communication system of claim 72, wherein the timing phase controller comprises the error generator,

wherein the timing phase controller is responsive to the output of the reconstruction filter.

74. (Original) The information communication system of claim 72, wherein the gain controller comprises the error generator,

wherein the gain controller is responsive to the output of the reconstruction filter.

75. (Original) The information communication system of claim 47, wherein the first filter and the second filter each comprise a Finite Impulse Response filter.

76. (Previously Presented) A disk drive comprising the information communication system of claim 47.

77. (Original) The information communication system of claim 47, wherein at least the VGA, ADC, first filter, second filter, and at least one of the timing phase controller and gain controller are formed on a monolithic substrate.

78. (Original) The information communication system of claim 47, wherein the information communication system is compliant with a standard selected from the group consisting of 802.11, 802.11a, 802.11b, 802.11g and 802.11i.

79. (Previously Presented) A method for controlling at least one of gain and timing phase of a communication system, comprising the steps of:

a.) amplifying an input signal to generate an amplified signal;

b.) converting the amplified signal into a digital signal to generate a converted signal;

c.) filtering the converted signal to generate a first filtered signal in accordance with a first plurality of filter coefficients,

wherein the first plurality of filter coefficients are updated according to a first least mean square (LMS) process, and

wherein at least one filter coefficient of the first plurality of filter coefficients is constrained;

d.) filtering the first filtered signal to generate a second filtered signal in accordance with a second plurality of filter coefficients,

wherein a number of filter coefficients of the second plurality of filter coefficients comprises one of less than and equal to a number of the filter coefficients of the first plurality of filter coefficients; and

e.) controlling at least one of a gain of step (a.) and a timing phase of step (b.) in response to the second filtered signal.

80. (Original) The method of claim 79, wherein the second plurality of filter coefficients are updated according to an adaptation process.

81. (Original) The method of claim 80, wherein the adaptation process comprises one of a second LMS process and a zero-forcing process.

82. (Previously Presented) The method of claim 79, wherein at least two filter coefficients of the first plurality of filter coefficients are constrained, and wherein the method further comprises the steps of:

f.) updating a value of at least one filter coefficient of the second plurality of filter coefficients to provide a gain of step (d.) that is associated with a change in gain error from step (c.); and

g.) modifying the gain of step (a.) based upon the gain of step (d.), to compensate for the change in gain error from step (c.).

83. (Previously Presented) The method of claim 79, wherein at least two filter coefficients of the first plurality of filter coefficients are constrained, and where the method further comprises the steps of:

f.) updating a value of at least one filter coefficient of the second plurality of filter coefficients to provide a timing phase of step (d.) that is associated with a change in timing phase error introduced by step (c.); and

g.) modifying a timing phase of step (b.) based upon the timing phase of step (d.), to compensate for the change in timing phase error introduced by step (c.).

84. (Original) The method of claim 79, wherein the second plurality of filter coefficients comprises one of two and three filter coefficients.

85. (Previously Presented) The method of claim 84, wherein the two filter coefficients of the second plurality of filter coefficients comprise "a" and "1+b", respectively, and

wherein the three filter coefficients of the second plurality of filter coefficients comprise "a", "1+b", and "–a", respectively.

86. (Previously Presented) The method of claim 85, further comprising the step of:

f.) updating the filter coefficient "a" according to equation:

$a[n+1] = a[n] - \alpha * \Delta\theta$,

wherein a[n+1] comprises a value of the tap weight coefficient "a" for a next sampling time of the input signal,

wherein a[n] comprises a value of the tap weight coefficient "a" for a current sampling time of the input signal,

wherein α comprises a first gain constant, and

wherein $\Delta\theta$ comprises a change in timing phase error associated with step (c.).

87. (Currently Amended) The method of claim 86, wherein the first plurality of filter coefficients comprises N filter coefficients, wherein N comprises at least four, wherein a third filter coefficient C_3 and a fourth filter coefficient C_4 of the first plurality of filter coefficients are constrained, and wherein <u>the</u> method further comprises the step of:

g.) updating $\Delta\theta$ according to equation:

$$\Delta\theta = \frac{(-\Delta C_3 * K_e - \Delta C_4 * K_o)}{K_e^2 + K_o^2},$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

88. (Previously Presented) The method of claim 87, further comprising the step of:

h.) updating K_e and K_o according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively,

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

89. (Original) The method of claim 87, wherein K_e and K_o each comprise a predetermined value.

90. (Previously Presented) The method of claim 87, further comprising the steps of:

h.) detecting an information sequence in the first filtered signal;

i.) reconstructing an information signal from the detected information sequence; and

j.) generating the error signal E[n] comprising a difference between the first filtered signal and the reconstructed information signal.

91. (Currently Amended) The method of claim 86, wherein the first plurality of filter coefficients comprises N filter coefficients, wherein N comprises at least four, wherein a third filter coefficient C_3 and a fourth filter coefficient C_4 of the first plurality of filter coefficients are constrained, and wherein the method further comprises the step of:

g.) updating Δθ according to equation:

$$\Delta\theta = \left(-\Delta C_3 * K_e - \Delta C_4 * K_o\right),$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

ΔC_3 = μ*E[n]*X[n-3] and

ΔC_4 = μ*E[n]*X[n-4], respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

92. (Previously Presented) The method of claim 91, further comprising the step of:

h.) updating K_e and K_o according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively, and

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

93. (Original) The method of claim 91, wherein K_e and K_o each comprise a predetermined value.

94. (Previously Presented) The method of claim 91, further comprising the steps of:

h.) detecting an information sequence in the first filtered signal;

i.) reconstructing an information signal from the detected information sequence; and

j.) generating the error signal E[n] comprising a difference between the first filtered signal and the reconstructed information signal.

95. (Previously Presented) The method of claim 85, further comprising the step of:

f.) updating the tap weight coefficient "b" according to equation:

$b[n+1] = b[n] - \beta * \Delta\Gamma$,

wherein b[n+1] comprises a value of the tap weight coefficient "b" for a next sampling time of the input signal,

wherein b[n] comprises a value of the tap weight coefficient "b" for a current sampling time of the input signal,

wherein β comprises a first gain constant, and

wherein $\Delta\Gamma$ comprises a change in gain error from step (c.).

96. (Previously Presented) The method of claim 95, wherein the first plurality of filter coefficients comprises N filter coefficients, wherein N comprises at least four, wherein a third filter coefficient C_3 and a fourth filter coefficient C_4 of the first plurality of filter coefficients are constrained, and wherein the method further comprises the step of:

g.) updating $\Delta\Gamma$ according to equation:

$$\Delta\Gamma = \frac{(-\Delta C_3 * K_o + \Delta C_4 * K_e)}{\sqrt{K_e^2 + K_o^2}},$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

97. (Previously Presented) The method of claim 96, further comprising the step of:

h.) updating K_e and K_o according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively,

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

98. (Original) The method of claim 96, wherein K_e and K_o each comprise a predetermined value.

99. (Previously Presented) The method of claim 96, further comprising the steps of:

h.) detecting an information sequence in the first filtered signal;

i.) reconstructing an information signal from the detected information sequence; and

j.) generating the error signal E[n] comprising a difference between the first filtered signal and the reconstructed information signal.

100. (Previously Presented) The method of claim 95, wherein the first plurality of filter coefficients comprises N filter coefficients, wherein N comprises at least four, wherein a third filter coefficient C_3 and a fourth filter coefficient C_4 of the first plurality of filter coefficients are constrained, and wherein the method further comprises the step of:

g.) updating $\Delta\Gamma$ according to equation:

$$\Delta\Gamma = (-\Delta C_3 * K_o + \Delta C_4 * K_e),$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

101. (Previously Presented) The method of claim 100, further comprising the step of:

h.) updating K_e and K_o according to equations:

$$K_e = \sum_{n=0}^{M} \gamma C_{2n}$$, and

$$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$$, respectively, and

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:
M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:
P = TRUNCATE(((N-1)/2) – 0.5).

102. (Original) The method of claim 100, wherein K_e and K_o each comprise a predetermined value.

103. (Previously Presented) The method of claim 100, further comprising the steps of:

h.) detecting an information sequence in the first filtered signal;

i.) reconstructing an information signal from the detected information sequence; and

j.) generating the error signal E[n] comprising a difference between the first filtered signal and the reconstructed information signal.

104. (Previously Presented) The method of claim 79, further comprising the steps of:

f.) detecting an information sequence in the first filtered signal;

g.) reconstructing an information signal from the detected information sequence; and

h.) generating an error signal, wherein the error signal is associated with the reconstructed information signal.

105. (Original) The method of claim 79, wherein the method is compliant with a standard selected from the group consisting of 802.11, 802.11a, 802.11b, 802.11g and 802.11i.

106. (Original) An information communication system, comprising:

means for amplifying an input signal received by the information communication system to generate an amplified signal;

means for converting the amplified signal into a digital signal to generate a converted signal;

first means for filtering the converted signal to generate a first filtered signal,

wherein tap weight coefficients of the first means for filtering are updated according to a first least mean square (LMS) adaptation means,

wherein at least one tap weight coefficient of the first means for filtering is constrained;

second means for filtering the first filtered signal to generate a second filtered signal,

wherein a number of tap weight coefficients of the second means for filtering comprises one of less than and equal to a number of the tap weight coefficients of the first means for filtering; and, at least one of:

means for controlling a gain of the means for amplifying in response to the second filtered signal; and

means for controlling a timing phase of the means for converting in response to the second filtered signal.

107. (Previously Presented) The information communication system of claim 106, wherein tap weight coefficients of the second means for filtering are updated according to adaptation means for updating a tap weight coefficient.

108. (Previously Presented) The information communication system of claim 107, wherein the adaptation means comprises one of second LMS adaptation means and zero-forcing adaptation means for updating a tap weight coefficient.

109. (Previously Presented) The information communication system of claim 106, wherein at least two tap weight coefficients of the first means for filtering are constrained, and wherein the information communication system further comprises:

means for updating a value of at least one tap weight coefficient of the second means for filtering to provide a gain of the second means for filtering that is associated with a change in gain error from the first means for filtering; and

means for modifying a gain of the means for amplifying based upon the gain of the second means for filtering, to compensate for the change in gain error from the first means for filtering.

110. (Previously Presented) The information communication system of claim 106, wherein at least two tap weight coefficients of the first means for filtering are constrained, and where the information communication system further comprises:

means for updating a value of at least one tap weight coefficient of the second means for filtering to provide a timing phase of the second means for filtering that is associated with a change in timing phase error introduced by the first means for filtering; and

means for modifying a timing phase of the means for converting based upon the timing phase of the second means for filtering, to compensate for the change in timing phase error introduced by the first means for filtering.

111. (Previously Presented) The information communication system of claim 106, wherein the second means for filtering comprises one of two-tap filter means and three-tap filter means for filtering said first filtered signal.

112. (Original) The information communication system of claim 111, wherein tap weight coefficients of the two-tap filter means comprise "a" and "1+b", respectively, and

wherein tap weight coefficients of the three-tap filter means comprise "a", "1+b", and "–a", respectively.

113. (Previously Presented) The information communication system of claim 112, further comprising:

means for updating the tap weight coefficient "a" according to equation:

$a[n+1] = a[n] - \alpha * \Delta\theta$,

wherein a[n+1] comprises a value of the tap weight coefficient "a" for a next sampling time of the input signal,

wherein a[n] comprises a value of the tap weight coefficient "a" for a current sampling time of the input signal,

wherein α comprises a first gain constant, and

wherein $\Delta\theta$ comprises a change in timing phase error associated with the first means for filtering.

114. (Previously Presented) The information communication system of claim 113, wherein the first means for filtering comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first means for filtering are constrained, and wherein the means for updating the tap weight coefficient comprises:

means for updating $\Delta\theta$ according to equation:

$$\Delta\theta = \frac{(-\Delta C_3 * K_e - \Delta C_4 * K_o)}{K_e^2 + K_o^2},$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

115. (Original) The information communication system of claim 114, wherein the means for updating the tap weight coefficient comprises:

means for updating K_e and K_o according to equations:

$K_e = \sum_{n=0}^{M} \gamma C_{2n}$, and

$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$, respectively,

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

116. (Original) The information communication system of claim 114, wherein K_e and K_o each comprise a predetermined value.

117. (Original) The information communication system of claim 114, comprising:

means for detecting an information sequence in the first filtered signal,

wherein the means for detecting is responsive to an output of the first means for filtering;

means for reconstructing an information signal from the information sequence,

wherein the means for reconstructing is responsive to an output of the means for detecting; and

means for generating an error signal,

wherein the means for generating an error signal is responsive to the output of the first means for filtering and an output of the means for reconstructing, and

wherein the means for generating an error signal generates the error signal E[n] comprising a difference between the output of the first means for filtering and the output of the means for reconstructing.

118. (Previously Presented) The information communication system of claim 113, wherein the first means for filtering comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first means for filtering are constrained, and wherein the means for updating the tap weight coefficient comprises:

means for updating Δθ according to equation:

$$\Delta\theta = \left(-\Delta C_3 * K_e - \Delta C_4 * K_o\right),$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

119. (Original) The information communication system of claim 118, wherein the means for updating the tap weight coefficient comprises:

means for updating K_e and K_o according to equations:

$$K_e = \sum_{n=0}^{M} \gamma C_{2n}\text{, and}$$

$$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}\text{, respectively, and}$$

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

$M = \text{TRUNCATE}((N-1)/2)$, and

wherein P is determined according to equation:

$P = \text{TRUNCATE}(((N-1)/2) - 0.5)$.

120. (Original) The information communication system of claim 118, wherein K_e and K_o each comprise a predetermined value.

121. (Original) The information communication system of claim 118, comprising:

means for detecting an information sequence in the first filtered signal,

wherein the means for detecting is responsive to an output of the first means for filtering;

means for reconstructing an information signal from the information sequence,

wherein the means for reconstructing is responsive to an output of the means for detecting; and

means for generating an error signal,

wherein the means for generating an error signal is responsive to the output of the first means for filtering and an output of the means for reconstructing, and

wherein the means for generating an error signal generates the error signal E[n] comprising a difference between the output of the first means for filtering and the output of the means for reconstructing.

122. (Previously Presented) The information communication system of claim 112, further comprising:

means for updating the tap weight coefficient "b" according to equation:

$b[n+1] = b[n] - \beta * \Delta\Gamma$,

wherein b[n+1] comprises a value of the tap weight coefficient "b" for a next sampling time of the input signal,

wherein b[n] comprises a value of the tap weight coefficient "b" for a current sampling time of the input signal,

wherein β comprises a first gain constant, and

wherein ΔΓ comprises a change in gain error from the first means for filtering.

123. (Previously Presented) The information communication system of claim 122, wherein the first means for filtering comprises N tap weight coefficients, wherein N comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first means for filtering are constrained, and wherein the means for updating the tap weight coefficient comprises:

means for updating ΔΓ according to equation:

$$\Delta\Gamma = \frac{(-\Delta C_3 * K_o + \Delta C_4 * K_e)}{\sqrt{K_e^2 + K_o^2}},$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu * E[n] * X[n-3]$ and

$\Delta C_4 = \mu * E[n] * X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

124. (Original) The information communication system of claim 123, wherein the means for updating the tap weight coefficient comprises:

means for updating K_e and K_o according to equations:

$$K_e = \sum_{n=0}^{M} \gamma C_{2n} \text{ , and}$$

$$K_o = \sum_{n=0}^{P} \gamma C_{2n+1} \text{ , respectively,}$$

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

125. (Original) The information communication system of claim 123, wherein K_e and K_o each comprise a predetermined value.

126. (Original) The information communication system of claim 123, comprising:

means for detecting an information sequence in the first filtered signal,

wherein the means for detecting is responsive to an output of the first means for filtering;

means for reconstructing an information signal from the information sequence,

wherein the means for reconstructing is responsive to an output of the means for detecting; and

means for generating an error signal,

wherein the means for generating an error signal is responsive to the output of the first means for filtering and an output of the means for reconstructing, and

wherein the means for generating an error signal generates the error signal E[n] comprising a difference between the output of the first means for filtering and the output of the means for reconstructing.

127. (Previously Presented) The information communication system of claim 122, wherein the first means for filtering comprises N tap weight coefficients, wherein N

comprises at least four, wherein a third tap weight coefficient C_3 and a fourth tap weight coefficient C_4 of the first means for filtering are constrained, and wherein the means for updating the tap weight coefficient comprises:

means for updating ΔΓ according to equation:

$$\Delta\Gamma = \left(-\Delta C_3 * K_o + \Delta C_4 * K_e\right),$$

wherein ΔC_3 and ΔC_4 are updated according to equations:

$\Delta C_3 = \mu*E[n]*X[n-3]$ and

$\Delta C_4 = \mu*E[n]*X[n-4]$, respectively,

wherein K_e and K_o are based on at least one of a tap weight coefficient and a predetermined value,

wherein μ comprises a second gain constant,

wherein E[n] comprises an error signal for a current sampling time of the input signal,

wherein X[n-3] comprises a value of the input signal at a third previous sampling time of the input signal, and

wherein X[n-4] comprises a value of the input signal at a fourth previous sampling time of the input signal.

128. (Original) The information communication system of claim 127, wherein the means for updating the tap weight coefficient comprises:

means for updating K_e and K_o according to equations:

$$K_e = \sum_{n=0}^{M} \gamma C_{2n}$$, and

$$K_o = \sum_{n=0}^{P} \gamma C_{2n+1}$$, respectively, and

wherein γ comprises a "+1" when ((2*n) modulo 4) = 0 and comprises a "–1" otherwise,

wherein M is determined according to equation:

M = TRUNCATE((N-1)/2), and

wherein P is determined according to equation:

P = TRUNCATE(((N-1)/2) – 0.5).

129. (Original) The information communication system of claim 127, wherein K_e and K_o each comprise a predetermined value.

130. (Original) The information communication system of claim 127, comprising:

means for detecting an information sequence in the first filtered signal,

wherein the means for detecting is responsive to an output of the first means for filtering;

means for reconstructing an information signal from the information sequence,

wherein the means for reconstructing is responsive to an output of the means for detecting; and

means for generating an error signal,

wherein the means for generating an error signal is responsive to the output of the first means for filtering and an output of the means for reconstructing, and

wherein the means for generating an error signal generates the error signal E[n] comprising a difference between the output of the first means for filtering and the output of the means for reconstructing.

131. (Original) The information communication system of claim 106, comprising:

means for detecting an information sequence in the first filtered signal,

wherein the means for detecting is responsive to an output of the first means for filtering;

means for reconstructing an information signal from the information sequence,

wherein the means for reconstructing is responsive to an output of the means for detecting; and

means for generating an error signal,

wherein the means for generating an error signal is responsive to an output of the means for reconstructing, and

wherein the means for generating an error signal is in communication between an output of the second means for filtering and inputs of the means for controlling the gain and the means for controlling the timing phase.

132. (Original) The information communication system of claim 106, wherein the first means for filtering and the second means for filtering each comprise a Finite Impulse Response filter means.

133. (Previously Presented) A disk drive comprising the information communication system of claim 106.

134. (Previously Presented) The information communication system of claim 106, wherein at least the means for amplifying, the means for converting, the first means for filtering, the second means for filtering, and at least one of the means for controlling a gain of the means for amplifying and the means for controlling a timing phase of the means for converting is formed on a monolithic substrate.

135. (Original) The information communication system of claim 106, wherein the information communication system is compliant with a standard selected from the group consisting of 802.11, 802.11a, 802.11b, 802.11g and 802.11i.

136. (Original) An information communication system, comprising:

a variable gain amplifier (VGA), wherein the VGA is responsive to an input signal of the information communication system;

an analog-to-digital converter (ADC), wherein the ADC is responsive to an output of the VGA;

a first filter,

wherein tap weight coefficients of the first filter are updated according to a first least mean square (LMS) engine,

wherein the first filter is responsive to an output of the ADC, and

wherein at least one tap weight coefficient of the first filter is constrained;

a second filter,

wherein the second filter is responsive to an output of the first filter, and

wherein a number of tap weight coefficients of the second filter comprises one of less than and equal to a number of the tap weight coefficients of the first filter; and

a gain controller for controlling gain of the VGA, wherein the gain controller is in communication with the VGA and responsive to the output of the second filter.

137. (Original) An information communication system, comprising:

a variable gain amplifier (VGA), wherein the VGA is responsive to an input signal of the information communication system;

an analog-to-digital converter (ADC), wherein the ADC is responsive to an output of the VGA;

a first filter,

wherein tap weight coefficients of the first filter are updated according to a first least mean square (LMS) engine,

wherein the first filter is responsive to an output of the ADC, and

wherein at least one tap weight coefficient of the first filter is constrained;

a second filter,

wherein the second filter is responsive to an output of the first filter, and

wherein a number of tap weight coefficients of the second filter comprises one of less than and equal to a number of the tap weight coefficients of the first filter; and

a timing phase controller for controlling timing phase of the ADC, wherein the timing phase controller is in communication with the ADC and responsive to an output of the second filter.

138. (Original) An information communication system, comprising:

means for amplifying an input signal received by the information communication system to generate an amplified signal;

means for converting the amplified signal into a digital signal to generate a converted signal;

first means for filtering the converted signal to generate a first filtered signal,

wherein tap weight coefficients of the first means for filtering are updated according to a first least mean square (LMS) adaptation means,

wherein at least one tap weight coefficient of the first means for filtering is constrained;

second means for filtering the first filtered signal to generate a second filtered signal,

wherein a number of tap weight coefficients of the second means for filtering comprises one of less than and equal to a number of the tap weight coefficients of the first means for filtering; and

means for controlling a gain of the means for amplifying in response to the second filtered signal.

139. (Original) An information communication system, comprising:

means for amplifying an input signal received by the information communication system to generate an amplified signal;

means for converting the amplified signal into a digital signal to generate a converted signal;

first means for filtering the converted signal to generate a first filtered signal,

wherein tap weight coefficients of the first means for filtering are updated according to a first least mean square (LMS) adaptation means,

wherein at least one tap weight coefficient of the first means for filtering is constrained;

second means for filtering the first filtered signal to generate a second filtered signal,

wherein a number of tap weight coefficients of the second means for filtering comprises one of less than and equal to a number of the tap weight coefficients of the first means for filtering; and

means for controlling a timing phase of the means for converting in response to the second filtered signal.

140. (Previously Presented) A computer program stored on a computer readable medium for controlling at least one of gain and timing phase of a communication system, wherein the computer program performs the steps of:

a.) filtering an input signal to generate a first filtered signal in accordance with a first plurality of filter coefficients;

b.) updating the first plurality of filter coefficients according to a first least mean square (LMS) process;

c.) constraining at least one filter coefficient of the first plurality of filter coefficients;

d.) filtering the first filtered signal to generate a second filtered signal in accordance with a second plurality of filter coefficients,

wherein a number of filter coefficients of the second plurality of filter coefficients comprises one of less than and equal to a number of the filter coefficients of the first plurality of filter coefficients; and

e.) outputting at least one of a gain control signal and a timing phase control signal in response to the second filtered signal.